Mem. Natn. Sci. Mus., Tokyo, (16), December 1, 1983

# Neogene Termites from Northeastern Districts of Japan, with References to the Occurrence of Fossil Insects in the Districts

By

**Ienori FUJIYAMA***

藤山家徳*: 東北地方の新第三紀シロアリ化石
付　同地方の昆虫化石の産状

An investigation of natural history of northeastern Japan has carried on through the years of 1982 and 1983 by the National Science Museum of Tokyo. This paper deals with the fossil termite fauna of the area. The insect fossils other than termites will be reported elsewhere. The occurrences of insect fossils in the area are summarized in this paper, and some comments on geology of every locality and fossil occurrences are given in Japanese at the end of this paper.

The writer expresses sincere thanks for the courtesy given him during the survey in 1982 by the following persons: Prof. Sadamasa MURAI of Iwate University, Prof. Taisuke TAKAYASU of Akita University, Prof. Saburo YOSHIDA of Yamagata University, Mr. Yûji KAWAKAMI of the Iwate Prefectural Museum, Mr. Yukio FUJITA of Nanyô City, Mr. Yoshihei UEMATSU of Tsuruoka, Mr. Shin OSHIKIRI of Yuzawa and Mr. Masaki NAGANE of Hanamaki. He is, also, indebted to Mr. Kazuhiko UEMURA of our museum, Prof. Katsura MORIMOTO of Kyushu University, Mr. Masayuki OISHI of the Iwate Prefectural Museum and Assoc. Prof. Kazuo AMANO of Ibaragi University for offering the knowledge on geology, floras and recent termite or the specimens for study.

## Notes on Geology and Insect Fossils in the Area Investigated

The area investigated under the project is the Backbone Range of Northeastern Districts of Honshu and west of it. It is bounded to the east by Kitakami Massif composed of Paleozoic and Mesozoic strata.

Since the Early Miocene a narrow subsidence belt had existed along the Japan Seaside of Japanese Islands. The surveyed area covers the northern part of this belt. The study on the geologic development of the western part of Northeastern Districts has been carried out by KITAMURA (1959, etc.) and others, and it is summarized by him in this volume together with recent information.

* Department of Paleontology, National Science Museum, Tokyo
国立科学博物館 地学研究部

In the area the basement rocks, Permian sediments and Mesozoic granitic rocks, are exposed only in limited areas, and are overlain by Neogene strata at the most part. KITAMURA (1959) inquired the geologic development of the Neogene of this area, and divided into eight stages for convenience. In the stage I, assigned to the Lower Miocene, a narrow subsidence zone appeared in the area of the present Backbone Range. The sediments are deposited in the inland lake basins. These non-marine deposits often contain fossil floras known as the Aniai-type indicating a temperate condition (HUZIOKA, 1964). Accompanied with plant fossils a few insects have been found at Aniai (A1 in the figure 1).

In the stage II, the subsidence zone was invaded by sea, and subsequently the marine transgression progressed to the west foreland area. The beds bearing rich fossil plants are deposited in the lowlands along the seashore. These floras known as the Daijima-type, indicate rather warmer temperature instead of the temperate Aniai Flora. A few insect fossils are found from Nozoki, Tsuruoka and Ikazuchi (B1 through B3). The upper part of the Lower Miocene is assigned to the geologic age of them.

Fig. 1. Localities of fossil insects in the Northeastern Districts of Japan. A1 Aniai, B1 Nozoki, B2 Tsuruoka, B3 Ikazuchi, C1 Tayama, C2 Araya, C3 Miyata, C4 Tazawako, C5 Shizukuishi, C6 Toyosawa Dam, C7 Hanayama, C8 Sanzugawa, C9 Akakura, C10 Akiu, C11 Kamiwada, D1 Tamaniwa.

Subsequently, the subsidence zones were shifted westward, and the sea withdrew from the Backbone Range area. The knowledge of floras in the successive stages III and IV is poor. In the stage V, assigned to the Upper Miocene, the present Backbone Range area was exposed above sea level. In the lifted area, many lacustrine deposits, composed of mostly pyroclastic rocks, appeared, though the age of those deposits somewhat differs each other within the Late Miocene. Abundant plant fossils contained in those deposits indicate temperate condition (UEMURA, 1977). Some of the lacustrine deposits are accompanied with fossil insects. The localities so far known in the equivalent strata are counted by eleven, though their insect faunas are poor except a few localities, e.g. Akakura, Sanzu-gawa, Kamiwada and Shizukuishi (C1 through C11).

In the stage V, the sediments intercalated by lignite seams were deposited in the subsiding lowland areas, in which some elytra of leaf-beetle have been found (D1).

The fossil insects collected at each locality are listed in Table 1, in which each numeral

Table 1. Occurrence of fossil insects in the Northeastern Districts of Japan.

| | D1 Tamaniwa (玉庭) | C11 Kamiwada (上和田) | C10 Akiu (秋保) | C9 Akakura (赤倉) | C8 Sanzugawa (三途川) | C7 Hanayama (花山) | C6 Toyosawa Dam (豊沢ダム) | C5 Shizukuishi (雫石) | C4 Tazawako (田沢湖) | C3 Miyata (宮田) | C2 Araya (荒屋) | C1 Tayama (田山) | B3 Ikazuchi (雷) | B2 Tsuruoka (鶴岡) | B1 Nozoki (及位) | A1 Aniai (阿仁合) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ephemeroptera | | 11 | | | | | | | | | | | | | | |
| Odonata (nymph) | | 1 | | | | | | | | | | | | | | |
| Isoptera | | 1 | 1 | | | | | 4 | | 2 | | | | | | |
| Dermaptera | | | | ?1 | | | | | | | | | | | | |
| Orthoptera | | | | | | | | | | | | | | | | |
| Plecoptera | | 2 | | | 1 | | | | | | | | | | | |
| Homoptera Aphididae | | | | | 12 | | | | | | | | | | | |
| others | | 10 | | 14 | 4 | | | | | | | | | | | |
| Heteroptera Pentatomidae | | | | | 1 | | | 3 | | 2 | | | | | | |
| others | | 1 | | 1 | 5 | | | | | 1 | | | | | | |
| Thysanoptera | | 1 | | | | | | | | | | | | | | |
| Neuroptera | | 3 | | | | | | | | | | | | | | |
| Coleoptera Carabidae | | | | | | | | | 1 | | | | | | | 1 |
| Staphilinidae | | | | | 8 | | | | | | | | | | | |
| Silphidae | | | | 1 | | | | | | | | | | | | |
| Scarabaeidae | | 1 | 1 | 1 | | | | | | | | | | | | |
| Cerambycidae | | | | | 1 | | | | | | | | | | | |
| Chrysomelidae | 2 | | | 15 | 2 | 1 | | 8 | | 1 | | | | | | |
| others | | 2 | | | 1 | | 2 | | | | | | ?1 | | | |
| Trichoptera | | | | | | | | | | | | | | | 1 | |
| Lepidoptera | | 1 | | | 1 | | | | | | | | | | | |
| Diptera Tipulidae | | 2 | 1 | 5 | | | | | | | | | | | | |
| Chironomidae | | 9 | | | 5 | | | | | | | 1 | | | | |
| Mycetophilidae | | 34 | 1 | 18 | 14 | | | | | | | | | | | |
| Sciaridae | | 31 | | 13 | 5 | | | 4 | | | | 1 | | | | |
| Bibionidae | | 27 | | 9 | 20 | | | 1 | | | | | | ?1 | | |
| Syrphidae | | | | | 1 | | | | | | | | | | | |
| others | | 10 | | 7 | 7 | | | | | | | | | | | |
| Hymenoptera Tenthredinoidea | | 3 | | 2 | | | | | | | | | | | | |
| Ichneumonoidea | | 13 | | 4 | 15 | | | | | | 1 | | | | | |
| Chalcidoidea | | 1 | | | 1 | | | | | | | | | | | |
| Formicidae | | 44 | 1 | 20 | 10 | | | 6 | | 5 | | 1 | | | | |
| others | | | | | 2 | | | | | | | 1 | | | | |
| Arachnida | | 17 | | | 1 | | | | | | | | | | | |

indicates numbers of individuals rather than number of species, as their specific identification have not yet been completed.

## Fossil Termites from the Northeastern Districts

Eight termite specimens have been found in the area, of which two are so fragmentary that they are not identificable even at generic level.

Family Hodotermitidae SNYDER

Subfamily Hodotermitinae HOLMGREN

Genus *Ulmeriella* MEUNIER, 1920

***Ulmeriella uemurai***, sp. nov.

(Pl. 1, figs. 1, 2; Figs. 2, 3)

*Type specimens*: A forewing and a hind wing attached on separate pieces of mudstone, occurred at the same locality and in the same fossil bed. It is natural, the writer considers, that these wings belong to the same species viewing their shape, size, colored membrane and manner of cubitus though without positive evidence. Miyata, Akita Prefecture, Japan. Miyata Formation, Late Miocene. Collected by Kazuhiko UEMURA. Stored at the National Science Museum, Tokyo, reg. nos. NSM-PA12210 and PA12211.

*Description*: *Forewing* (Holotype, PA12210): Brown-colored, especially darker in brownish black along costal margin and near base. Length 13.3 mm, maximum width 3.8 mm. Costal margin rather straight, hind margin slightly curved. Wing gradually broadening toward apex and broadest at 3/10 of wing from apex. Tip posterior to midline of wing. Scale about 0.9 mm long. Humeral suture slightly curved outward. Sc invisible on the type specimen. $R_1$ separate from stem of Rs on suture; ending at 3.2 mm of costal margin from suture. $R_2$ probably coalescent in $R_3$, $R_{2+3}$ ending at 7.4 mm of costal margin. Rs furcate into two superior and two inferior branches, of which one with a secondary branch. Inferior branches of Rs reaching behind tip of wing. M arising from Rs at 0.8 mm from suture; once bifurcate distally. Cu shooting six branches toward hind margin, of which some with secondary branches. Reticulations invisible.

Fig. 2. *Ulmeriella uemurai* FUJIYAMA, sp. nov. Forewing. Holotype, NSM-PA12210. Miyata, Akita Pref., Miyata Formation, Late Miocene. ×7.7
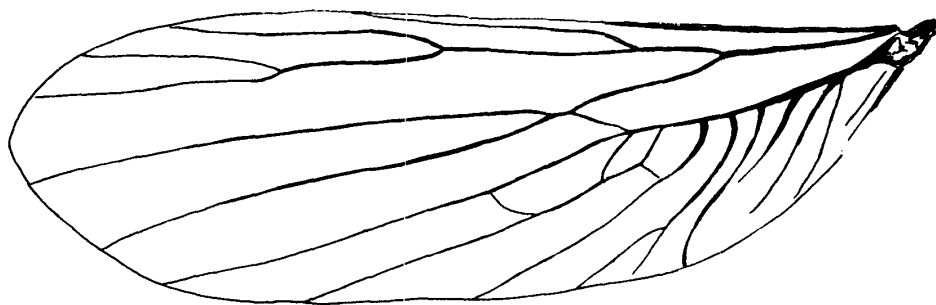
Fig. 3. *Ulmeriella uemurai* FUJIYAMA, sp. nov. Hind wing. Paratype, NSM-PA12211. Miyata, Akita Pref., Miyata Formation, Late Miocene. ×7.7

*Hind wing* (Paratype, PA12211): Length 13.4 mm, width 4.3 mm. Costal margin nearly parallel to hind margin. Apex of wing at just middle of outer margin. Scale smaller than forewing though not clearly distinguished. Sc absent. $R_1$ close to costal margin, seemingly ending on costal border a little beyond first forking of Rs. Rs forked three times, wanting inferior branches, so $R_5$ not reaching apex of wing. Radius occupying less than 1/3 of wing. M arising from stem of Rs at 3.2 mm from base, early bifucate; connected with Cu by a cross vein. Cu apart from R+M on suture; parallel to M, shooting seven branches toward hind margin. An indistinct vein, probable anal vein, along postero-anal margin. Reticulations invisible.

*Comparison*: The wing shape of the present specimens is similar to that of *Ulmeriella bauckhorni* but not to other *Ulmeriella* species, e.g. *U. cockerelli, U. latahensis* or *U. rubinesis*. Especially the forewing is closely allied to some specimens of *U. bauckhorni* except for the Rs closer to costal margin and the fewer branches of Rs and Cu. Hind wing of the specimen shows somewhat abnormal venation especially X-shaped crossing M owing to the presence of a cross vein. The lack of the inferior branches of R and the M arising far from the base of Rs are conspicuous in this specimen. Whether these features in the hind wing are essential to the species or caused by variation is not be decided. This problem will be solved by the additional materials.

By all accounts the venation of the present new species are most closely allied to *Ulmeriella bauckhorni* MEUNIER (including *U. rottensis* STATZ) known from the Oligocene of Rott in Siebengebirge, Germany. The new species is the latest example in geologic age in the world. It is interesting that the present species is most related to the Oligocene species of Europe in spite of the presence of the nearer species in geologic age or in geographic distribution.

### *Ulmeriella shizukuishiensis* sp. nov.

(Pl. 1, fig. 3; Fig. 4)

*Type specimen*: Holotype. A rignt hind wing, without counterpart. Shizukuishi, Iwate Prefecture, Japan. Masuzawa Formation, Late Miocene. Stored at the National Science Museum, Tokyo, reg. no. NSM-PA12212.
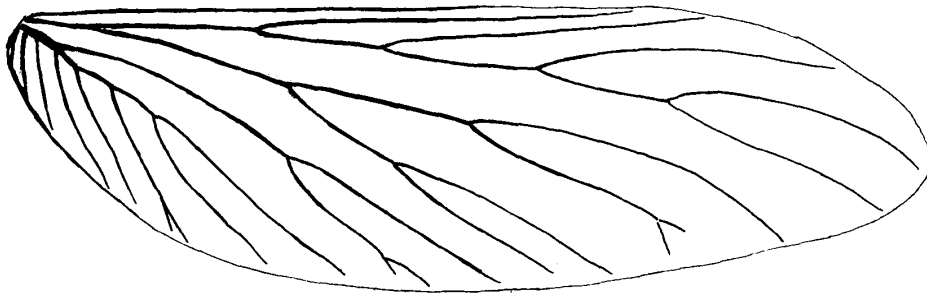
Fig. 4. *Ulmeriella shizukuishiensis* FUJIYAMA, sp. nov. Hind wing. Holotype, NSM-PA12212. Shizukuishi, Iwate Pref., Masuzawa Formation, Late Miocene. ×7.7

*Description*: Colored in brown, darker along costal border. Length 13.6 mm, width 4.2 mm. Basal 2/3 of costal margin nearly straight; hind margin moderately curved; apical margin strongly curved. Sc absent. $R_1$ close and parallel to costal border, ending on costal margin of 2/3 from base. Rs bifurcate three times; most posterior branches terminating behind apex of wing. M arising from stem of R beyond suture, bifurcate twice. Cu forking near base; anterior branch of Cu only once bifurcate; posterior one shooting off six branches toward postero-anal margin.

*Comparison*: The present species differs from *U. uemurai* and *U. bauckhorni* in its wing shape, though resembling in their brown-colored membrane. Wing venation coincides with that of neither species of *Ulmeriella* ever known. A small number of branches of R (four branches) is characteristic. A posterior branch of Cu is peculiar, but it may be not essential feature as a species but an abnormal one occassionally appeared as a variation.

## Subfamily Termopsinae HOLMGREN

### Genus *Hodotermopsis* HOLMGREN, 1911

### ***Hodotermopsis iwatensis***, sp. nov.

(Pl. 1, fig. 5; Fig. 5)

*Type specimen*: Holotype. A winged specimen lacking its head and apendages, showing upper surface. Without counterpart. Masuzawa, Shizukuishi, Iwate Prefecture, Japan. Masuzawa Formation, Late Miocene. Collected by Masayuki OISHI. Stored at the Iwate Prefectural Museum, reg. no. IPMM20599.

*Description*: *Head*: Not preserved (something attached in front of pronotum in the specimen is not head). *Pronotum*: Foremargin of pronotum arched; hind margin without small notch at middle; 1.6 mm long, 2.7 mm wide. *Forewing*: Basal suture slightly curved outward, at a right angle to costal margin. Costal margin nearly straight for 3/4 of length of wing, inner margin slightly curved for 2/3 of wing; apex of wing about at middle of outer margin. Length of forewing 14.0 mm, width 3.6 mm. Sc short. $R_1$ simple, ending at 1/4 of length of costal margin of wing. $R_{2+3}$ distally folking, ending at about middle of costal margin. $R_{4+5}$ shooting off five branches, its terminal reaching behind tip of wing. M with
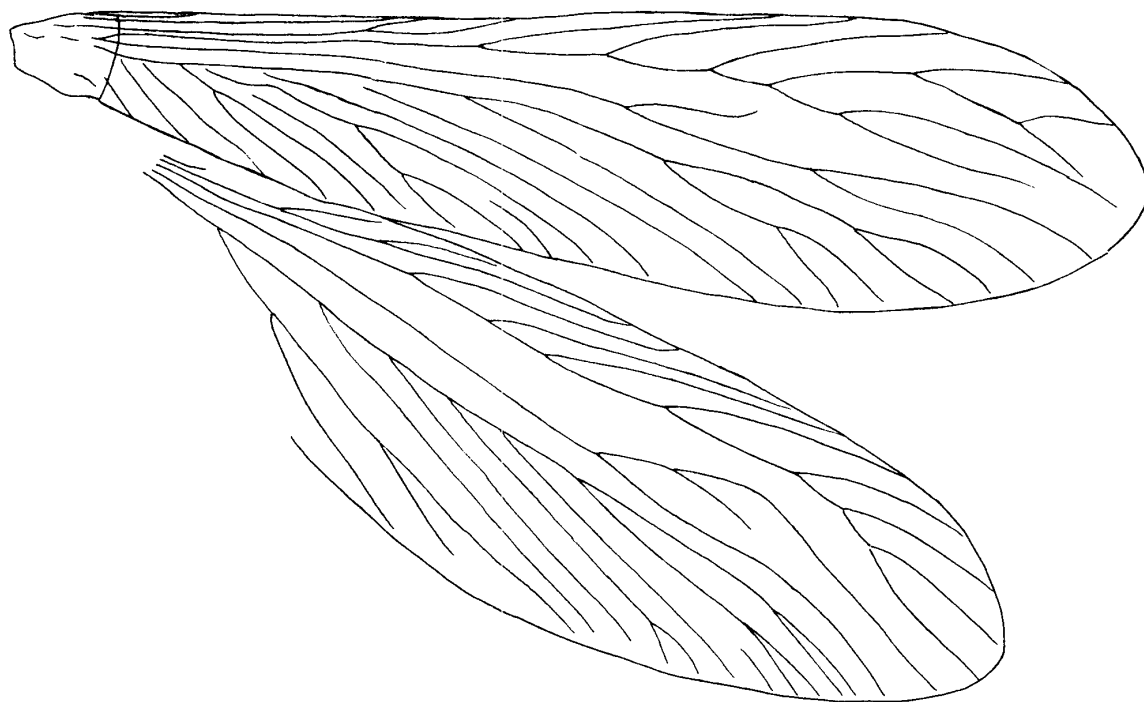
Fig. 5. *Hodotermopsis iwatensis* FUJIYAMA, sp. nov. Holotype, IPMM20599. Masuzawa Formation, Late Miocene. ×7.7

Fig. 6. *Hodotermopsis japonicus* HOLMGREN. Living species, for comparison. Amami Is., Japan. ×7.7

only two branches; about equidistant between $R_{4+5}$ and Cu in proximal half. Cu having ten branches, of which some with secondary and tertiary branches. Stem of Cu situated before mid line of wing at proximal half, so Cu occupying a large area. *Hind wing*: Length of preserved part about 12.3 mm, width 4.0 mm. Basal suture, Sc, $R_1$ not observed. $R_{2+3}$ having two branches, terminating beyond middle of costal margin. $R_{4+5}$ with seven branches, ending a little behind apex of wing. M once bifurcate. Cu having more than seven branches, running near mid line of wing at proximal half.

*Comparison*: The present species belongs to Termopsinae without doubt. Comparing with the living and extinct genera of Termopsinae by the figures and specimens, *Hodotermopsis* (fig. 6) is most related to this species. Simple $R_1$, two or three furcate $R_{2+3}$ and $R_{4+5}$ terminating behind the tip of wing are common features between *Hodotermopsis* and this fossil. Other features are not inconsistent to be assigned the species to the genus *Hodotermopsis*, especially the venation of hind wing is closely allied. Only the narrower median area of the forewing in the fossil is different from the living species *Hodotermopsis japonicus.*

The genus *Hodotermopsis* has been known from the eastern parts of the Oriental Region: *H. japonicus* HOLMGREN from parts of Japan and *H. sjoestedti* HOLMGREN from northern Viet Nam. *Hodotermopsis japonicus* is restricted in the small islands Amami and Yaku, located in the northern part of Southeast Islands of Japan and the southern tip of Kyushu.

### Subfamily Stolotermitinae HOLMGREN

### Genus *Stolotermes* HAGEN, 1858

### ***Stolotermes? amanoi,*** sp. nov.

(Pl. 1, fig. 4; Fig. 7)

*Type specimen*: Holotype. Left forewing, lacking basal part. Without counterpart. Anadozawa, Akiu, Miyagi Prefecture, Japan. Anadozawa Formation, Late Miocene. Collected by Kazuo AMANO. Stored at the National Science Museum, Tokyo, reg. no. NSM-PA12213.

*Description*: Forewing brownish, narrow especially at basal part, broadening distally and broadest at 2/3 from base; 13.0 mm in length, 4.8 mm in maximum width. Costal margin nearly straight for 4/5 of length of wing, hind margin curved. Apex of wing a little

Fig. 7. *Stolotermes? amanoi* FUJIYAMA, sp. nov. Forewing. Holotype, NSM-PA12213. Akiu, Miyagi Pref., Anadozawa Formation, Late Miocene. ×7.7

behind median line of wing. Basal suture not preserved except a small part near costal margin, at an angle of about 60° to costal margin. Sc indistinguished, probably very close to costal margin and short. $R_1$ lacking, $R_{2+3}$ simple; running close to and parallel with costal margin, seeming to reach 1/4 of costal margin from suture. $R_{4+5}$ reaching tip of wing, with seven superior branches toward costal margin and an inferior branch. M so close to Cu at basal part as like coalescent in Cu; bearing four branches with secondary branches. M not weaker than R or Cu. Cu terminating at inner margin before 4/9 from suture; with six branches, some of which having secondary branches; area occupied by Cu very narrow instead of that by M. Space between R and M broad with some recticulations.

*Comparison and remarks*; Media occupying a large space in inferior half of wing instead of cubitus is characteristic in the present fossil wing. Such feature as extremely reduced Cu is found only in the genus *Stolotermes*, of which most of species have more much reduced Cu than the present fossil species according to the illustrations by HAGEN (1858), HOLMGREN (1912), MJÖBERG (1920) and HILL (1921). On the other hand, $R_{4+5}$ of the present fossil has an inferior branch, which is like to *Porotermes quadricollis* (RAMBUR) according to the figures by SILVESTRI (1903) and HOLMGREN (1912), but the wing shape are not similar each other.

Some species of Termopsinae, especially to *Zootermopsis angusticollis* (HAGEN), are somewhat allied to the present fossil in its wing shape, bearing a few inferior branches, rather narrow cubital area, but they are distinguished by not lacking $R_1$ and the manner of Sc, $R_{2+3}$ and M. The media of the present fossil is so extremely close to the cubitus at the basal part beyond the suture that these veins seem to be coalescent. This feature is not seen in the illustrations of living species so far as the writer examined.

The present fossil species entirely corresponds neither with *Stolotermes* or *Porotermes*, but the remained small part of suture seems to indicate the genus *Stolotermes*. The writer assignes the present species to the genus *Stolotermes* though tentatively, because the wing venation of primitive termites is very variable.

### Family Rhinotermitidae LIGHT

Gen. et sp. indet.

(Pl. 1, fig. 6)

*Specimen examined*: Winged imago, showing inner cast of upper side. Kamiwada, Nigashi-oitama, Yamagata Prefecture. Wada Formation, Late Miocene. Collected by Yukio FUJITA, stored in the FUJITA's Fossil Collection.

*Description*: Length without wings 6.4 mm. Length of head to tip of mandibles 1.4 mm, width 1.2 mm. Teeth of mandibles and eyes invisible in the specimen. Antenna long, more than 1.5 times of length of head even in preserved part; 16 segments remaining, further distal part missing in the specimen. Clypeus seemingly with a median suture. Eyes not protruded on sides. Pronotum rather narrow than head, long (c.a. 0.7 mm). Distal halves of forewings lost; veins or reticulations invisible except two thick veins running parallel with costal border; basal stub of forewing rather large, c.a. 0.5 mm long. Legs paler

in color than body, detailed structure indistinguished. Abdomen rather long, apical part including cerci lost.

*Comparison*: Except the shape of head, long antennae, not protruded eyes, and pronotum narrower than head, available features to identify are not preserved in the specimen. If the median suture of clypeus actually present, it seems to be reasonable to be assigned to the family Rhinotermitidae considering together with other some features observed, although further identification is impossible. At last, the present fossil never belong to Mastotermitidae, Kalotermitidae or Termitidae.

Only two rhinotermitid termites, *Reticulitermes speratus* and *Coptotermes formosanus* live in the main islands of Japan, in the present time. But, they never correspond to the present fossil species.

## A Brief Note on the Termite Fauna in the Northeastern Districts of Japan

Present paper is the first report of the fossil termite fauna from Japan. Of five species above described, four species belong to the primitive family Hodotermitidae (A subfamily Termopsinae in the family is often separated and raised to the family Termopsidae).

Several species of the genus *Ulmeriella* have been recorded from the mid-latitude zone of Europe, Siberia and North America. The finding of the genus from Japan links the localities of Siberia and U.S.A. (EMERSON, 1968, fig. 1).

The genus *Hodotermopsis* have been composed of two living species, *H. japonicus* from several southern islands of Japan and *H. sjoestedti* from northern Viet Nam. The living species of *Hodotermopsis* may be relics of the group flourished through the geologic age.

Though it is questionable, if the assignment to the genus *Stolotermes* is correct, the present and past distribution of the genus is similar to that of Mastotermitidae, that is worldwide during the geologic age and limited at present.

Comparison of the termite fauna of the districts with those of other areas from either the same or different geologic ages in Japan, is impossible at present, because the identification of Japanese fossil termites has not been completed.

## 摘　　要

国立科学博物館で継続実施中の日本列島の自然史科学的総合研究に参加し，1982年，東北地方の脊梁山地以西，日本海までの地域を対象として調査を行った．この地域は，古い地層よりなる北上山地と対蹠的に，大部分が第三紀中新世初期に始まる新しい堆積物よりなっている．本地域の地質構造発達史の研究は，北村信（1959, 1981 ほか）によって進められ，化石フロラは藤岡一男（HUZIOKA, 1964 ほか）により明かにされ，1974年に中新世フロラが総括されている．

当地域の中新世初期の沈降域は，現在の東北脊梁山地とその西方の地域に生じ，この陸内湖盆に堆積した地層は，温帯林の組成を示す〝阿仁合型植物群〟をふくみ，炭層をはさむこともある．次いで，この細長い沈降域は海域となり，縁辺の海岸に近い低地に堆積したと思われる地層からは，より温暖な気候を指示する〝台島型植物群〟を産出する．中新世前期と考えられるこれらの植物化石層は，阿仁川上流以外にも，当地域の北から南まで点々と分布し，植物化石を豊富に産出するが，昆虫化石は意外に少なく，阿仁合型で1カ所，台島型と思われるところで3カ所，しかも各産地とも1～2個体の産出にすぎない．しかし，もし新

潟県佐渡の関（阿仁合型）のような火山活動に伴なって生じた湖盆の堆積物が発見されれば，今後昆虫化石の産出も期待できよう．

その後沈降域は西に移り，中新世後期には現在の脊梁山地の地域は隆起して海面上に現れた．活発な火山活動にともなって陥没性の湖盆が各所に生じ，そこに湖成堆積物が生成した．時代，環境に多少のちがいはあるものの，このような湖成層は脊梁山地の北から南に点々と存在し，豊富な植物化石を伴っている．この時代の当地域のフロラと地史については，植村和彦（1977）が研究を進めている．昆虫化石産地は現在のところ11産地が知られ，そのうち4～5か所からはかなりの数の産出があり，将来の発見も期待できる．

脊梁山地の西の地域では，鮮新世に入ってもひきつづき海岸低地に褐炭をともなう堆積があり，1か所で甲虫化石が発見されている．

調査地域内から産出した昆虫化石について，産地ごとの産出個体数をタクサ別にして Table 1 に示す．標本には不完全なものが多く，属・種までの同定は未了なので，種類数については表わせなかった．

本報文では，これら脊梁山地以西の新第三紀昆虫化石のうち，シロアリ（等翅目）に属するものを報告する．4産地より8個体のシロアリ化石を得たが，うち2個体は破片で同定に耐えないので除き，6個体について下記の5種を記載した．何れも中新世後期の植物化石と共産したものである．

*Ulmeriella uemurai*, sp. nov.
*U. shizukuishiensis*, sp. nov.
*Hodotermopsis iwatensis*, sp. nov.
*Stolotermes? amanoi*, sp. nov.
Rhinotermitidae, gen. et sp. indet.

初めの4種は，原始的な科であるオオシロアリ科 Hodotermitidae に属し，このうち *Ulmeriella* 属は，ヨーロッパ，シベリア，北米の中緯度の地域から化石だけが発見されている絶滅属で，シベリアと北米の中間の日本でもその分布が知られたことになる．*Hodotermopsis*属は，わが奄美大島，屋久島，九州南端から1種，ベトナム北部から他の1種の現生種が知られているだけで，現生種は地質時代の遺存種と考えられる．*Stolotermes* はオーストラリア，ニュージーランド，南アフリカから現生種6種が知られるのみで化石の記録はない．原始的なシロアリ類の翅脈にはかなりの個体変異があり，1個体の翅脈のみで属の決定をするには多少の危険がともなうが，もしこの種の所属がこれで正しければ，分布上興味深い．しかし，現在オーストラリア北部のみにすむ Mastotermitidae の化石が世界各地（未記載であるが日本からも）で発見されることからみて，不思議な現象とはいえない．最後の種は，ミゾガシラシロアリ科のものと思われる．属を示す特徴が保存されておらず，新種の設定はできなかったが，現在日本の主部に生息する現生種2種とは全く異なる．

## References


EMERSON, A.E., 1968. A revision of the fossil genus *Ulmeriella* (Isoptera, Hodotermitidae, Hodotermitinae). *Amer. Mus. Novitates*, (2332): 1–22.

HAGEN, H.A., 1858. Catalogue of the specimens of neuropterous insects in the collection of British Museum. Part 1, Termitina. 34pp.

HILL, G.F., 1921. New and rare Australian termites, with notes on their biology. *Proc. Linn. Soc. N.S.W.*, **46** (4): 433–456.

HOLMGREN, N., 1911. Termitenstudien. 2. Systematik der Termiten. *K. Svenska Vetensk. Akad. Handl.*, **46** (6): 1–88, pls. 1–6.

HUZIOKA, K., 1964. The Aniai Flora of Akita Prefecture, and the Aniai-type floras in Honshu, Japan. *Jour. Min. Coll. Akita Univ.*, Ser. A, **3** (4): 1–105.

KITAMURA, N., 1959. Tertiary orogenesis in Northeast Honshu, Japan. *Contr. Inst. Geol. Paleont. Tohoku Univ.* (49): 1–98. (In Japansese.)

MJÖBERG, E., 1920. Isoptera. Results of Dr. E. Mjöberg's Swedish scientific expedition to Australia, 1910–1913. *Arkiv. Zool.*, **12** (15): 1–128, pls. 1–8.

SILVESTRI, F., 1903. Contribuzione alla conoscenza dei Termite e Termitifili dell' America meridionale. *Redia*, 1: 1–234, pls. 1–6.
UEMURA, K., 1977. Late Miocene floras in the Japan Sea side of Northeast Honshu, Japan. Prof. K. Huzioka Mem. Vol.: 333–343. (In Japanese.)

付．東北地方における昆虫化石の産出状況

東北地方脊梁山地以西の既知昆虫化石産地の各について，産出化石，産出地層，化石フロラ，関係報告などについて略述する．

A 1. 阿仁合（秋田県北秋田郡阿仁町根子(ねっこ)）

阿仁川上流の第三系，阿仁合層群の下部に当たる阿仁合夾炭層（井上，1950, 1951）は，頁岩・砂岩を主とし，炭層をはさんでいる．この中より産出する植物化石は温帯林の組成を示し，阿仁合型植物群（HUZIOKA, 1964）として知られている．阿仁合夾炭層は数か所に弧立して分布するが，根子の村落内に露出する含植物化石層からオサムシの上翅の化石が発見されている（佐藤　彰氏採集）．このほか根子の別な露頭から昆虫化石が得られたというが未見．

B 1. 及位(のぞき)（山形県最上郡真室川町及位赤倉）

及位の塩根川沿い，赤倉附近の帯緑白色凝灰岩中から馬場敬氏により美事なトビケラの前翅 1 個が発見された．馬場氏によると，雄勝川層（大沢ほか，1979）に当り，南沢熔結凝灰岩部層より約 100 m 下位に位置する．雄勝川層からは植物化石が報告されていないが，その上にのる大仙山層には台島型植物がふくまれ，雄勝川層と同時異相とされる飯沢層の植物化石は阿仁合型とも台島型とも断定できない．本昆虫化石産出層は，岩相などからみて台島型植物群の層準の可能性が大きい．

B 2. 鶴岡（山形県鶴岡市岡山）

鶴岡市の西方，旧西田川地区には細長く台島型植物化石をふくむ中新統が分布し，地質は棚井（1951），西田・茅原（1960）により研究された，上郷層群（植松の鶴岡層群）の善宝寺累層には草井谷などの有名な植物化石産地があり，植物化石は TANAI (1952)，植松（1972）により研究されている．これに相当する地層が，鶴岡市の南西部より山形・新潟県境方向にのびている．昆虫化石は極めて稀で，わずかに鶴岡市岡山の鶴岡高等工業専門学校の構内より 1 化石が得られたにすぎない．これは阿部襄氏の発見であるが，最近亡くなられ標本を直接検することができなかった．

B 3. 雷(いかずち)（新潟県岩船郡山北(さんぼく)町雷）

山形県温海町の東南より新潟県山北町にかけて細長く湖成堆積物の関川層が分布し，泥岩中に台島型の植物や魚の化石を産する（藤岡・古賀，1981）．雷部落うらの雷川沿いの地域は植物化石産地として有名であるが，この中から昆虫化石が 1 個発見されている．しかし標本は未見．

C 1. 田山（岩手県二戸郡安代町田山）

旧田山町北部には湖成堆積物と考えられる田山層が分布し，その中の上新田層状凝灰岩層（大口，1969）中には豊富な植物化石がふくまれている．田山駅北方 1.6 km の大原橋附近の川沿いの露頭から村井貞允教授は植物化石に伴なうクロバネキノコバエを発見．今回の調査でも小型種化石数個を追加することができた．

C 2. 荒屋（岩手県二戸郡安代町荒屋）

田山の東 10 km，荒屋の安比川対岸の崖の，葉理の発達した泥岩中より小型のハチと甲虫各 1 個を得た．その上数 m の層準には植物化石層がある．北村の北上川流域地質図（1981）によると，田山層の上にのる荒屋層とされているが（正確な地点は石英安山岩として彩色されている），田山層と荒屋層との関係には問題が残されており，またこの地域の〝荒屋層〟が田山層に相当する可能性もある．

C 3. 宮田（秋田県仙北郡西木村宮田，戸沢および桧木内又沢）

上桧木内地区を中心として分布する宮田層は，扇状地性の礫岩で始まり，下部層の一部から有孔虫化石が

報告されているが，大部分は火砕性の湖沼堆積物で，下部と上部から植物化石を産出する．植物化石はHUZIOKA & UEMURA (1973) により詳細に研究されたが，植村和彦氏により植物と共にシロアリ，カメムシ，アリなどが発見された．今回の調査でも宮田の川岸の露頭から甲虫，アリなどの化石を得，現在12個体に達している．宮田の植物化石を大量に産出した化石層は大水のため採集が困難となっている．

C 4.  . 田沢湖（秋田県仙北郡田沢湖町田沢湖北東岸）

田沢湖の北東岸に流紋岩質凝灰岩にはさまれて，うすく剝離する泥岩があり，植物化石をふくむ．ここで甲虫化石が1個発見された．北村の北上川流域地質図（1981）では田沢層にぬられているが，植物化石からは宮田層相当層と考えられる（HUZIOKA & UEMURA, 1973）．

C 5. 雫石（しずくいし）（岩手県岩手郡雫石町舛沢および用ノ沢）

雫石盆地の中新統の，MURAI (1962) の坂本川層（早川ら，1953 の山津田層）および舛沢層（早川ら，1953 の湯口層上部）から，特に後者からは植物化石を豊富に産出し，MURAI (1962–63) によりくわしく研究され，前者は御明神フロラ，後者は御所フロラと名付けられている．舛沢層からは昆虫化石も産出し，村井教授によりカメムシ，アリが発見されたのを初めとして，相当数の化石がみつかっている．

C 6. 豊沢ダム（岩手県花巻市豊沢ダム）

花巻市街の北西 15 km にある豊沢ダムの左岸の黄褐色シルト岩中より，花巻市立桜台小学校の児童によりゴミムシダマシ化石が1個発見された．同校の長根正樹教頭のお取計いで目下研究中．標本は岩手県立博物館に寄贈される予定．この地層は北上川流域地質図（1981）では矢櫃層とされ，早川ら（1954）の湯口層の下部に相当する．この矢櫃層は北方雫石盆地近くまでのび雫石盆地の含植物化石層舛沢層の下部と同時異相の関係にあるとされている．

C 7. 花山（岩手県和賀郡湯田町柳沢）

湯田町一帯に分布する花山層は，海成の黒沢層の上に不整合にのる湖沼堆積物で亜炭層をはさむ．植物化石は MURAI (1968) によりくわしく調べられ，根ノ白石植物群などに近く，その時代を鮮新世前期とされたが，根ノ白石植物群も最近は上部中新世と考えられ，また中新〜鮮新世として扱われることもある（北村，北上川流域地質図，1981）．村井教授によりハムシが1個発見されているが，沼沢地性を思わせる岩相などから，昆虫化石について多くは期待できない．

C 8. 三途川（さんず）（秋田県湯沢市下新田）

三途川層は主として凝灰質の砕屑岩よりなり，湯沢市三途川を中心に分布する．湖成堆積物と考えられ，植物化石を多産する．この中に稀に昆虫化石をふくむが，母岩が緻密なため保存がよくたいへん美しい．植物化石は HUZIOKA & UEMURA (1974) によりくわしく研究され，その際植村氏により昆虫化石が採集された．これと別に秋田県立湯沢高等学校の押切伸教諭もここの昆虫化石を収集し，両者合せて117個の標本が採集されている．押切教諭は研究結果を 1979, 1982 に発表されたので，これにより三途川の昆虫化石相が概観できるようになった．

C 9. 赤倉（山形県最上郡最上町赤倉）

赤倉温泉の東南に分布する菅（かん）ノ平層（田口，1961）（正確な地名は菅ノ平で，すげのたいらとよむ）は，凝灰質砂岩，泥岩を主体とし，泥岩中にふくまれる植物化石は赤倉植物群として知られている．赤倉温泉の東，保京橋から下流に好露出があり，植物化石層中より昆虫化石を産する．正式に記載されたものはセミ1種（FUJIYAMA, 1982）のみであるが，小型種はかなりの産出がある．植物化石については植村（1977）が概説しているが，フロラの内容から，宮田，三途川などの後期中新世フロラより，わずかに新しい可能性もあるという．

C 10. 秋保（あきう）（宮城県名取郡秋保町穴戸沢）

穴戸沢層は秋保大滝の西，北西，南西に分れて分布する火山性砕屑岩を主体とする湖成堆積物で，下の青根層とは不整合の関係にある（天野，1980）．凝灰質シルト岩中に植物化石を産出するが，東北大学の学生

により穴戸沢でアリの化石が発見され，この地域の地質を研究された天野一男氏によりシロアリ，ガガンボなどが追加され，筆者もマグソコガネ等数個体を得ている．天野（1980）によると，植物化石層は層序関係などから台島型植物群に近縁とされているが，植村和彦氏によると，フロラの内容は三途川層のものに近く，中新世後期の可能性を示すとのことなので，ここではそのように扱う．

C 11. 上和田（山形県東置賜郡高畠町上和田）

米沢の北東にある上和田の盆地の非海成層は，和田層（皆川，1960 a, b）とよばれ，植物化石を含み，根ノ白石フロラに近似し，後期中新世のものと考えられる．1971年，たまたま藤田幸夫氏によって小黒川上流の堰堤工事現場より，植物化石に伴って昆虫化石の産出することが発見された．氏の精力的な採集によって多くの昆虫化石が集められたが，化石産出地点はわずか数カ月で埋戻され，採集不能になってしまった．この付近の植物化石については藤田（1971）の報告があり（阿多岐累層のフロラに近似するものとして後期鮮新世のものとされた），昆虫化石については別に30種よりなるリストを作製されている．山形城北女子高等学校の菊地俊彦・東海林秀矩両教諭も同産地の25個の昆虫化石について報告（1972）された．

D 1. 玉庭（山形県東置賜郡川西町玉庭大休場）

玉庭の西方山地の高峰累層と，その上の手ノ子累層は亜炭層をはさみ（その下は海成の宇津峠累層），植物化石を産出する．大休場附近の手ノ子累層中の泥岩層の露頭2か所で，植村和彦氏により好水辺性の甲虫の上翅2こが発見され，亜炭中にもネクイハムシの上翅が発見される．

## 文献


天野一男，1980. 奥羽脊梁山脈宮城・山形県境地域の地質学的研究．東北大学理学部地質学古生物学教室研究邦文報告（81）：1–56.

藤田幸夫，1972. 上和田産第三紀大型植物化石群について——昭和46年度内地留学報告書：137–161, pl. 1–2.

FUJIYAMA, I., 1982. Some fossil cicadas from Neogene of Japan. *Bull. Natn. Sci. Mus., Tokyo* Sec. C, 8 (4): 181–187.

早川典久・舟山祐士・斉藤邦三・北村　信，1954. 岩手県北上山地西縁より脊梁山地に亘る地域の新第三系の地質．東北鉱山学会誌，10：1–90.

早川典久・北村　信，1953. 雫石盆地西縁部の地質．岩石砿物砿床学会誌，37（1）：29–40.

HUZIOKA, K., 1964. The Aniai Flora of Akita Prefecture, and the Aniai-type floras in Honshu, Japan. *Jour. Min. Coll. Akita Univ.*, Ser. A, 3 (4): 1–105.

藤岡一男，1974. 日本の中新世植物群，植物化石研究会誌（5）：1–20.

藤岡一男・井上　武・高安泰助・加納　博，1949. 秋田県産特殊無煙炭の地質学的及び岩石学的研究——第一報　主として無煙炭の産状について．秋田鉱山専門学校地下資源開発研究所報告（1）：2–30.

藤岡一男・古賀　孝，1981. 東北地方西南部の中新世中期台島型植物群．地学雑誌 90（4）：235–246.

HUZIOKA, K. & K. UEMURA, 1973. The Late Miocene Miyata Flora of Akita Prefecture, Northeast Honshu, Japan. *Bull. Natn. Sci. Mus., Tokyo*, 16 (4): 661–738, pls. 1–18.

HUZIOKA, K. & K. UEMURA, 1974. The Late Miocene Sanzugawa Flora of Akita Prefecture, Northeast Honshu, Japan. *Ibid.* 17 (4): 325–366, pls. 1–11.

井上　武，1950. 阿仁合炭田荒瀬炭砿の地質並に炭鉱開発計画に就いて．秋田鉱山専門学校地下資源開発研究所報告（3）：1–10.

井上　武，1951 阿仁合炭田の範囲と石炭層賦存区域．同上（5）：1–10.

加藤磐雄・島田昱郎，1953. 栗駒火山西麓緑色凝灰相地域の地質及び特に三途川・鬼首盆地の湖成堆積物について．岩石鉱物鉱床学会誌，37（5）：178–190.

菊地俊彦・東海林秀矩，1972. 山形県産昆虫化石について．山形県城北女子高等学校紀要 (4)：25–29, pls. 1–6.

北村 信，1959. 東北地方における第三紀造山運動について——(奥羽脊梁山脈を中心として)——東北大学理学部地質学古生物学教室邦文報告，(49)：1–98.

北村 信，1981. 北上川流域地質図説明書 第2篇新第三系．225–277. 仙台．長谷地質調査事務所．

皆川信弥，1960a. 米沢・山形盆地東縁に分布する後期中新世非海成層について．山形大学紀要（自然科学），**5** (1)：: 1–10.

皆川信弥，1960b. 米沢盆地周辺における新第三紀層の層位学的および古生物学的研究（その4）——東南縁・東縁および東北縁の層序，火山活動，岩相変化および対比．地質学雑誌 **66** (779)：489–501.

MURAI, S., 1962–63. Geology and paleobotany of the Shizukuishi Basin, Iwate Prefecture, Japan. Part I, II–1, 2, 3. *Rep. Technol. Iwate Univ.*, **15** (1): 131–193; **15** (2): 1–34, pls. 1–9; **16** (1): 77–109, pls. 10–17; **16** (2): 45–65, pls. 18–20.

MURAI, S., 1968. On the Hanayama Flora. *Technol. Rep. Iwate Univ.*, **3** (3): 11–28, pl. 4.

西田彰一・茅原一也，1966. 西田川炭田地域の新第三系（その1）．新潟大学理学部地質鉱物学教室研究報告 (1)：31–57.

大口健志，1969. 岩手県田山周辺の地質．秋田大学地下資源開発研究所報告 (38)：1–16.

大沢 穠・大口健志・高安泰助，1979. 地域地質研究報告 5万分1図幅湯沢地域の地質．64 pp., 3 pls.

押切 伸，1979. 秋田県湯沢市三途川層から発見された昆虫化石．高校理科研究 (15)：50–54.

押切 伸，1982. 秋田県南部新第三紀三途川層中の昆虫化石について．26pp.

田口一雄，1961. 山形県最上郡小国川南方山地の第三系．地質学雑誌，**67** (786)：157–170.

棚井敏雅，1951. 山形県西田川炭田北部の地質構造．庄内平野周縁地域の地史学的研究（その1）．地質学雑誌，**57** (668)：157–170.

TANAI, T., 1952. Des fossiles végetaux dans le bassin houiller de Nishitagawa, Préfecture de Yamagata, Japon. *Jap. Jour. Geol. Geogr.*, **22**: 119–135.

植松芳平，1973. 庄内海岸線地域の植物化石とその教材化について．28pp., 7 pls.

植村和彦，1977. 東北地方日本海側の中新世後期植物群．藤岡一男教授退官記念論文集．333–343.

吉田三郎，1980. 5万分1地質図幅説明書 玉庭．24pp. 山形県商工労働部商工課．

吉田三郎・植松芳平，1979. 土地分類基本調査 鶴岡 表層地質：33–42. 経済企画庁．

**追記**——Table 1 作製後，豊沢ダムよりハチ類1，雫石より脈翅類1などが追加採集された．豊沢ダムの甲虫2は甲虫1に訂正．三途川にカワゲラ1，脈翅類1，ガ1，同翅類1を追加．

## Explanation of Plate 7

Fig. 1. *Ulmeriella uemurai*, sp. nov. Forewing. NSM-PA12210 (holotype). Miyata, Miyata Formation, Late Miocene. ×6.5

Fig. 2. Ditto. Hind wing. NSM-PA12211 (paratype). Miyata, Miyata Formation, Late Miocene. ×6.5

Fig. 3. *Ulmeriella shizukuishiensis*, sp. nov. Hind wing. NSM-PA12212 (holotype). Shizukuishi, Masuzawa Formation, Late Miocene. ×6.5

Fig. 4. *Stolotermes? amanoi*, sp. nov. Forewing. NSM-PA12213 (holotype). Akiu, Anadozawa Formation, Late Miocene. ×6.5

Fig. 5. *Hodotermopsis iwatensis*, sp. nov. IPMM20599 (holotype). Shizukuishi, Masuzawa Formation, Late Miocene. ×4

Fig. 6. Rhinotemitidae, gen. et sp. indet. FUJITA's Collection. Kamiwada, Wada Formation, Late Miocene. ×6.5

1
2
3
4
5
6